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WESTERN REGION VERIFICATION PROCEDURES

OPR: W/WR1x4 (J. Lorens)

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Signed

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Vickie Nadolski

Date

Director, Western Region

<u>Table of Contents:</u>	<u>Page</u>
1. Introduction	2
2. Public Weather Warning Verification	2
3. Marine Verification.	3
4. Aviation Verification	3
5. Fire Weather Verification.	4
5.1 Red Flag Warnings (RFW)	4
5.2 Fire Weather Watches (RFW)	4

Appendix

A. Additional Information	A-1
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1. Introduction: Western Region (WR) Weather Forecast Offices (WFOs) verify certain types of weather warnings, as specified below. This supplement covers the following watch and/or warning products; Winter Storm, High Wind, Coastal Flood, and certain types of marine, aviation, and fire weather products.

2. Public Weather Warning Verification: Verification statistics for public warning products are maintained at NOAA's National Weather Service "Stats on Demand" site (requires users to enter user name and password information; contact WR Meteorological Services Division (MSD) for site location and/or login information, if needed). NWS Western Region MSD is required to collect a portion of warning information from its WFOs and summarize it for NWS Headquarters for input to the national verification database.

For Winter Storm, High Wind, and Coastal Flood warnings and events, individual WFOs will enter verification information (monthly totals for the previous month), not later than the 21st of each month. If the 21st falls on a weekend or holiday, enter the data by the last working day prior to the 21st. For verification data entry, use the WR on-line verification web site (contact WR MSD if site location and/or login information is needed). **The following information is required for each warning category (see Appendix A for additional information):**

- a. Total number of warnings issued
- b. Total number of warnings which verified
- c. Total number of warnings which did not verify
- d. Total number of events (meeting warning criteria)

- e. Total number of events accompanied by a warning
- f. Total number of events not accompanied by a warning
- g. Average lead time (event-based)
- h. Total number of watches issued
- i. Total number of watches which led to verified warnings
- j. Average watch lead time (average of all watches which led to verified warnings)
- k. Total number of warnings not watched (warnings not preceded by a watch)

3. Marine Warning Verification: National marine verification statistics, including wind speed and wave height, are maintained at the NWS “Stats on Demand” web site (requires users to enter user name and password information; contact WR MSD for site location and/or login information, if needed). Verification statistics are calculated for individual WFOs, NWS Regions, and nationally, using forecast and observed data at 18 hour and 30 hour forecast times. Additionally, limited marine advisory/warning (including Small Craft Advisory and Gale Warning wind speed thresholds) and Special Marine Warning (SMW) verification data are available at this site.

Because of the limited nature of national marine verification information, WR coastal WFOs should develop and/or maintain local marine verification programs, with emphasis on forecast improvement. As a minimum, each WFO should locally verify Gale, Storm, and Hurricane Force Wind Warnings (as per current practice) to the maximum extent possible, using all available data, e.g. coastal ASOS observations, ship observations, appropriate C-MAN observations, QuikScat and SSM/I wind data, and/or other reliable sources of wind and/or wave height data). Coastal WFOs are also encouraged to locally verify wind speed, wind direction, and wave height forecasts through the duration of Coastal Waters Forecasts (CWF) (currently 5 days).

4. Aviation Verification: Terminal Aviation Forecast (TAF) verification information is available at the NWS “Stats on Demand” web site (requires users to enter user name and password information; contact WR MSD if site location and/or login information is needed). Other supplemental verification programs may be used by the WFO, but statistics from “Stats on Demand” will be used for any regional or national purposes. Aviation verification results will be evaluated by the WFO management team/focal point on a routine basis to determine strengths and weaknesses of the WFOs TAF program. This includes use of an individual’s statistics, both to recognize superior achievement and to determine if additional training is necessary.

WFOs are requested to produce reports for their staff and WR MSD on a quarterly basis, to be submitted not later than January 30, April 30, July 30, and October 30. The WFO can determine which statistics are most important and relevant to track for the quarterly report. However, at a minimum, the quarterly TAF report should contain the POD and FAR, for IFR and worse

(1000/3), for the 0-6 hour period, for all TAF sites and routine issuance times (00Z, 06Z, 12Z, 18Z).

- a. Probability of Detection (POD)
- b. False Alarm Rate (FAR)
- c. Critical Success Index (CSI)
- d. Lead Time (LT)
- e. Number of warnings issued by category (high wind, snow, thunderstorms, etc.)
- f. Number of events not warned (missed events), by category

5. Fire Weather Verification: WR WFOs will perform minimum routine fire weather product verification as detailed below. Additional verification may be performed by local agreement and clarified in Area Operating Plans (AOP). As a minimum, verification results will be included in all WFO Fire Weather Annual Reports.

5.1 Red Flag Warning (RFW): FAR, POD, and CSI will be calculated for Red Flag Warnings. However, verification statistics will be maintained separately for warnings issued for (expected) dry lightning events and (expected) synoptic events (i.e., wind and low humidity). Specific “Red Flag” criteria will be clearly defined in the AOP. Annual goals for FAR, POD, and CSI will be listed in the Western Region Annual Operating Plan and should be reflected in WFO AOPs.

5.2 Fire Weather Watches (RFW): Track the number of total watches issued and the number of watches that were followed by Red Flag Warnings.

APPENDIX A - Additional Information

1. **Winter Storm Warnings (WSW).**

- a. **Blizzard warnings, heavy snow warnings, and other hazardous winter precipitation events (meeting warning criteria) will be classified as a “winter storm”.** Do not include advisory criteria events.
- b. **Each zone for which a warning is issued counts as one warning, and each zone will be verified separately.** For example, a WSW issued for 10 zones counts as 10 warnings; if winter storm criteria are met in 10 zones, then 10 events are counted (events with a warning). Use local criteria when verifying winter storm warnings, including snow amount and aerial extent (e.g. was the event over a large enough area that a warning was merited?). Additionally, use “seasonally adjusted criteria” (e.g. first winter storm of the season may have lower criteria) and “elevation adjusted criteria” (e.g. 6 inches above 4,000 feet).
- c. **Verify warnings based on reports which are credible and representative of the zone. Avoid verifying warnings based solely on locally extreme amounts.**
- d. **Average Event Lead Time.** Lead time will be calculated as the elapsed time from warning issuance to the estimated time when warning criteria were met. Again, this will require judgment in many cases. Round to the nearest hour. The average lead time should be the arithmetic mean of all event lead times for the period reported (entire month, in most cases). Any event occurring without an issued warning will be treated as having zero lead time. Also, if a warning was issued within two hours after the event begun, use a zero lead time (i.e. do not count negative lead times).

2. **Winter Storm Watches.** Winter Storm Watches will also be verified to ensure WR WFOs are providing a valuable service to their customers. Not all watches necessarily will lead to warnings, so a simple tracking of POD, FAR, and CSI will not be tracked for watches. Instead, the following information will be tracked (within WR MSD only) to help measure the overall value of the watch program:

- a. **Number of watches issued.** Same as for 2a (page 2), but for watches.
- b. **Number of watches which led to verified warnings.** The total number of watches issued which directly led to a warning *which verified*.
- c. **Number of warnings not watched.** The total number *warnings issued which were not immediately preceded by a watch*.

- d. **Average Watch Lead Time.** The average lead time for all watches which led to verified warnings. Calculate watch lead times as the elapsed time from watch issuance to the time warning criteria were met.
- 3. **High Wind Warnings and Watches (NPW).** Similar to paragraphs 1 and 2 (this Appendix), but with respect to events expected to meet high wind warning criteria.
- 4. **Coastal Flood Warnings and Watches (CFW) (coastal WFOs only).** As for paragraphs 1 and 2 (above), but for events meeting Coastal Flood warning criteria.